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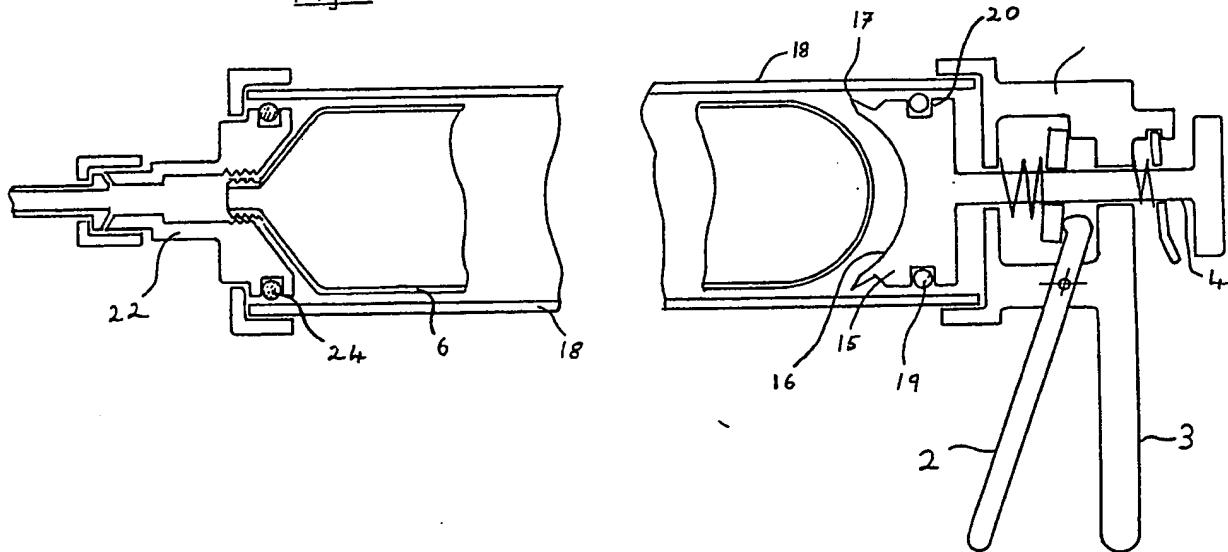
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## (54) Collapsible container and caulking gun for storage and dispensing or sealant composition

(57) A container 6 for an anaerobically curing composition for use in a caulking gun has collapsible walls formed of a material having sufficient air permeability to prevent substantial curing of an anaerobic composition contained therein, eg giving a shelf life in excess of a year. The container is preferably used in a caulking gun comprising a cylinder 18, and a plunger 15, with a semi spherical surface 16, which is an interference fit in the cylinder, and forms knife-edge seal 17 at its periphery. The container 6 is preferably of low density polyethylene formed by injection or blow moulding and has a wall thickness of 0.2 to 0.7 mm. An O-ring 19 guards against serious leakage of composition from the gun if the container 6 should rupture. The gun may also have a conical support 22 having a shape corresponding with that of the conical neck of the container 6, a further O-ring seal 24 being provided.

Fig 2



The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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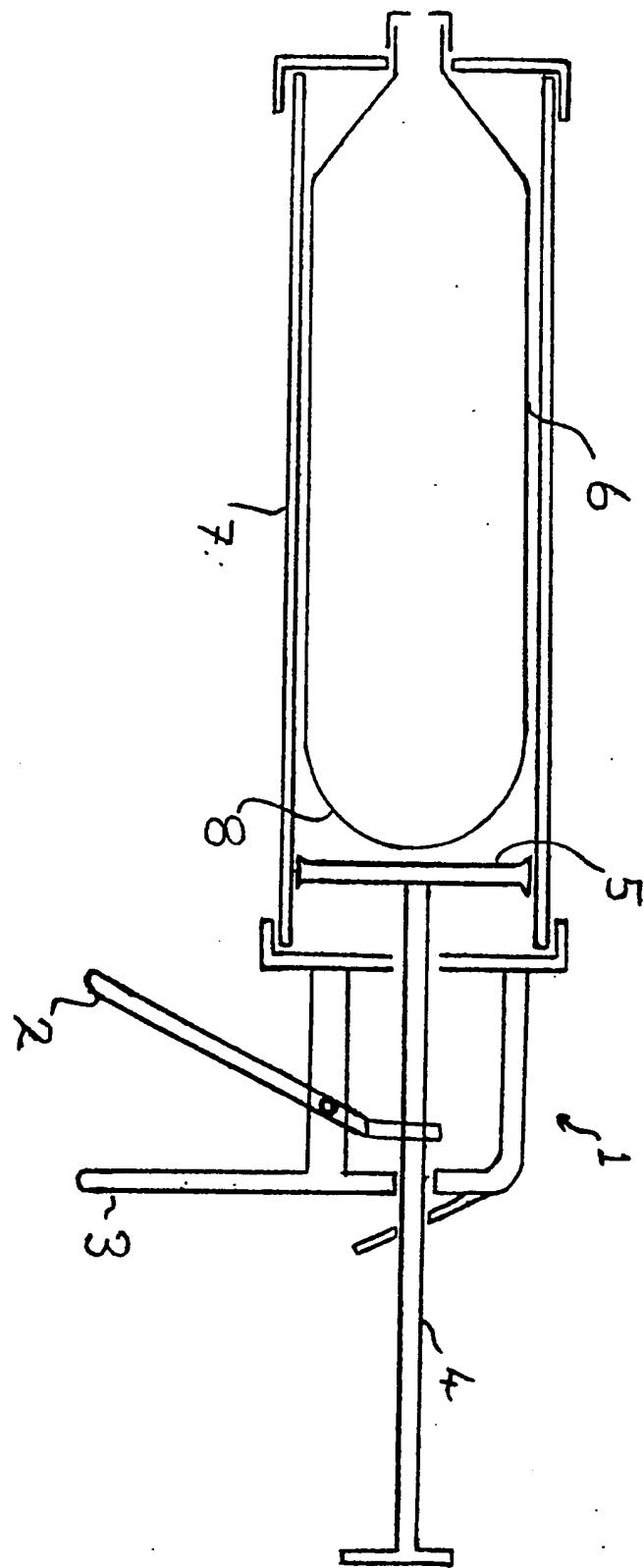
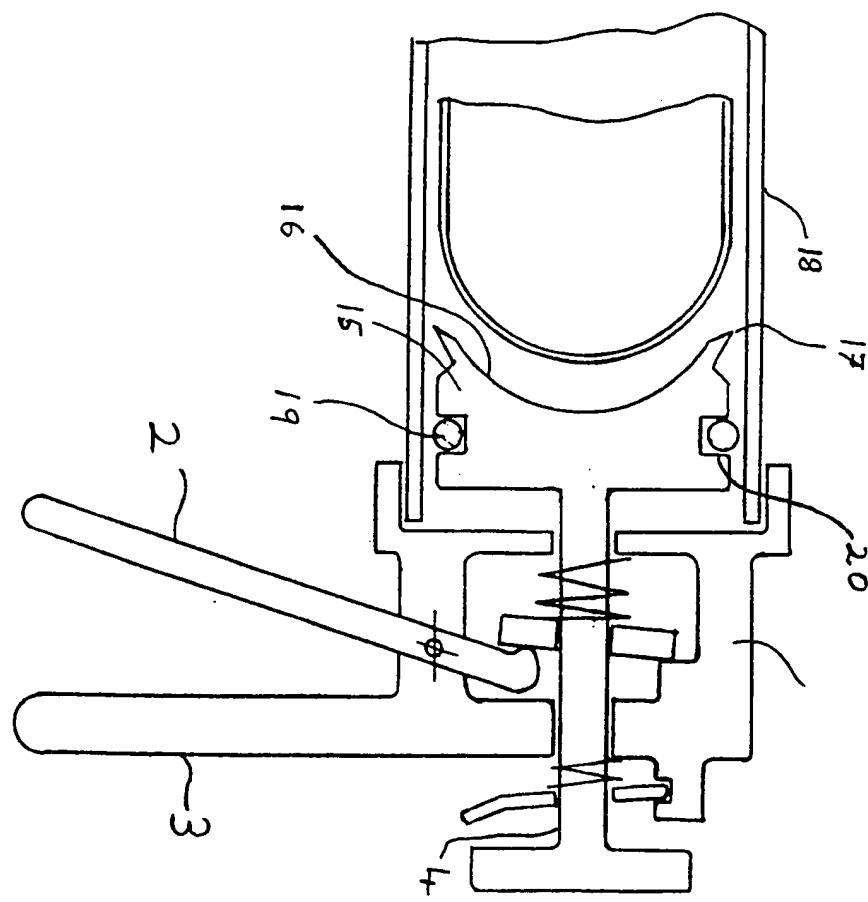
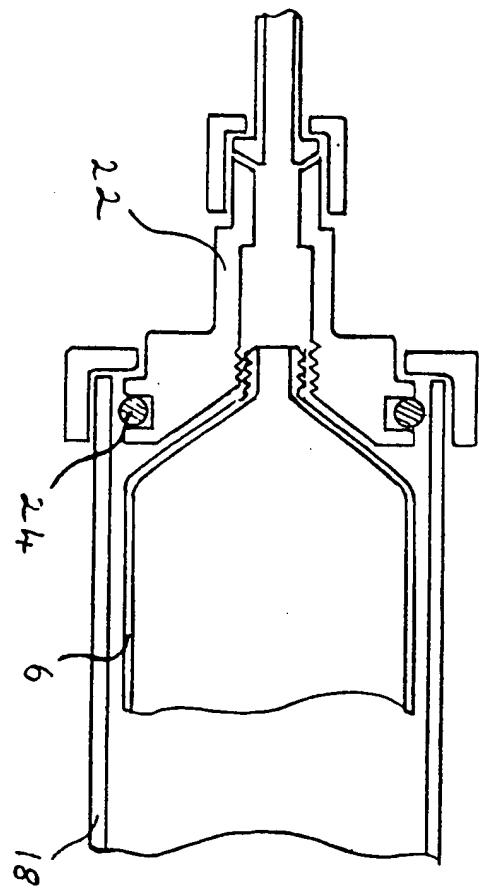


Fig 2



## SPECIFICATION

## Container and caulking gun for storage and dispensing of sealant composition

5 This invention relates to injection and caulking devices, and containers for sealing compositions and the like for use therewith, and in particular to injection and caulking guns for use with

10 compositions which cure anaerobically. Such compositions are used, for example, in the sealing of underground gas pipes, and in the formation of certain automotive gaskets.

15 Conventional mastics are frequently supplied in a disposable cylinder, equipped with a slideable piston, the cylinder serving both as a package in which the mastic is supplied, and also as a dispensing container for use in a caulking gun.

20 Anaerobic adhesives and sealants consist essentially of liquid monomers usually methacrylates, peroxide initiators and aromatic amine accelerators. They will polymerise to form a solid polymer when air is excluded and when catalysed by transition metal catalysts. They are

25 found useful for applications such as the locking and sealing of metal components, for example – nuts and bolts, pipe fittings, bearings and shafts. They are also used for sealing of metal flanged parts where they form a gasket seal when polymerised. The

30 viscosity of these products can be formulated to best suit their use. Gasketing anaerobics are traditionally formulated as thick pastes or gels so that beads of the product can be placed on vertical surfaces without flowing off.

35 Penetrating anaerobics are traditionally of a very low viscosity so that they can flow rapidly into tiny pores to seal articles such as porous metal castings. An example of such an article is the cast aluminum carburettor of a motor car.

40 Low viscosity (water like) anaerobics have found an application in the sealing of gas main pipes. At present, these compositions are injected into pipe joints using a standard skeleton caulking gun and a hard walled 315 ml polypropylene cartridge. The

45 product is poured into the cartridge on site prior to use from thin walled polyethylene containers, because the polypropylene cartridges are not suitable for the continuous storage of the anaerobic sealant. The present system has further

50 disadvantages.

(i) Tiny imperfection in the cartridge wall or plunger provide leak paths for the sealant. (ii) There is a strong possibility that an operator could burst a cartridge by applying too much hand pressure on the gun. (iii) These low viscosity sealants are irritants and there is a possibility of operators getting contaminated by these materials.

Anaerobic gasket pastes are generally applied in large automated applications by screen printing or

60 roll coating. The equipment is expensive and requires considerable set up time. In smaller applications, the product is applied to the components by squeezing out a continuous bead from a tube by hand. This process is time consuming

65 and cumbersome.

Because of their anaerobicity the liquids are generally packed in polyethylene bottles and the pastes are packed in polyethylene tubes. The size of the container, the wall thickness and the density of

70 the plastic is designed such that the diffusion of oxygen through the container wall and the product is sufficient to keep the product stable.

Because anaerobic mastics and caulk cures rapidly when air is excluded, it is generally unsatisfactory to

75 use such cylinders for anaerobic mastics as are conventionally used for other mastics, because the wall thickness of the caulking cylinders employed is too thick, and the compositions would cure in the caulking gun.

80 According to this invention, a container for an anaerobically curing composition, adapted for use in a caulking gun or the like, has collapsible walls formed of a material having a sufficient air permeability to prevent substantial curing of an

85 anaerobic composition contained therein.

By providing a thin-walled container, preferably of a low-density polyethylene, which is collapsible, in the sense that it may be inserted into a caulking gun, and the contents expelled by deformation of the

90 container, a package may be supplied which has sufficient structural integrity to withstand transport, but yet is sufficiently permeable to prevent substantial curing of the anaerobic composition. The container is preferably in the shape of a cylindrical

95 capsule, and may, for example, be formed by injection moulding or, preferably by blow moulding. For the maximum structural strength and for convenience in forming, it is desirable that the bottom surface of the container should be generally

100 hemispherical, although other shapes of container are possible.

The wall of the container preferably has sufficient permeability to give a shelf life of at least one year to an anaerobic-curing composition contained therein,

105 which is capable of substantial curing in from 10 to 15 minutes, on the exclusion of air.

A suitable material for the wall of the container is low-density polyethylene, having a thickness of from 0.2 to 0.7mm preferably 0.3 to 0.5mm. In a further

110 aspect of the invention, there is provided a collapsible container as described above, containing an anaerobically curing composition.

Because the container in accordance with the invention is deformed during use, it is suitable for

115 use only with an extrusion gun of the solid walled type. Accordingly, in a further aspect of the invention, there is provided a solid walled extrusion gun, having therein a collapsible container as described above, containing an anaerobically curing

120 composition. The relative dimensions of the container and the barrel of the caulking gun are such that a sufficient gap is left when the cylinder is inserted in the barrel of the caulking gun to provide at least a limited air circulation. The gap is preferably

125 from 0.2 to 1.0mm, preferably 0.5mm. It is desirable that the gap is not too large, so as to ensure uniform deformation of the container. The wall of the container may be smooth, or, in an alternative embodiment, may be corrugated, to best assure

130 uniform deformation.

The activating plunger of the extrusion gun utilised should be of a material and shape such as to minimise the risk of puncture to the collapsible container. A suitable extrusion gun, having a hard 5 wall of suitable strength, is one marketed by Sika Limited, under the Serial Number 9300-02. Such guns are referred to as "bulk guns".

In a particular preferred embodiment of the invention, the plunger may have a shape generally 10 similar to that of the end part of the collapsible container and particularly is preferably hemispherical in shape, so as to prevent the application of pressure to unsupported parts of the collapsible container, and thereby minimise the risk 15 of local rupture. Means may also preferably be provided to support the neck portion of the collapsible container.

A knife-edge seal is preferably formed between the 20 plunger and the container, to decrease the likelihood of trapping part of the containing wall, and thereby causing rupture. A further seal may be provided on the plunger of a material which is not swollen and deformed by anaerobic sealants, for example 25 formed of a fluorinated elastomer such as VITON.

25 A particular embodiment of the invention is described in more detail with reference to the accompanying drawings, in which:-

Figure 1 illustrates a collapsible container in accordance with the invention, in position in a 30 conventional extrusion gun, and

Figure 2 illustrates a preferred form of extrusion gun in accordance with the inventor.

Referring first to Figure 1, an extrusion gun 1 is of conventional form, preferably of the Sika 9300-02 35 type described above. As is very well known, the extrusion gun 1 has a trigger member 2, handle 3, and plunger 4, carrying a piston 5. A cylindrical container 6 having thin low density polyethylene walls is located in the barrel 7 of extrusion gun 1. The 40 base part 8 of cylinder 6 is of generally hemispherical shape. An operation of the trigger 2, cylinder 6 is deformed by piston 5, to expel therefrom an anaerobic composition contained therein.

A preferred form of extrusion gun in accordance 45 with the invention is illustrated in Figure 2.

The mechanical parts of the gun of Figure 2, in particular the trigger member 2, handle 3, and plunger 4, are essentially similar to those of the gun of Figure 1. The part of the plunger 15 however which 50 is intended to engage the base part of the cylinder containing the anaerobic sealant is formed in this case however with a hemi-spherical surface 16, having a curvature which corresponds essentially to that of the container with which the gun is proposed 55 to be used. The plunger part 15 is an interference fit in barrel 18, such that edges 17 of plunger 15 form a knife-edge seal with barrel 18. An O-ring 19 is provided, accommodated in circumferential groove 20 of plunger part 15, to guard against serious 60 leakage of sealant from the gun, if the collapsible container should rupture. O-ring 19 is formed of a fluorinated elastomer (VITON).

The plunger part 15 is formed of a rigid material, for example acetal, nylon or polytetrafluoroethylene, 65 and is joined to shaft part 4 of the plunger by means

of a screw-thread in its base.

The gun of Figure 2 also comprises a conical support 22, of a shape corresponding with that of the conical neck of the container with which the gun is 70 proposed to be used. Support 22 is also provided with an O-ring seal 24 of VITON.

A number of preferred embodiments will now be described in the following examples.

#### 75 Example 1

An blow moulding tool was designed for the injection moulding of a container in accordance with the invention. The tool was such as to provide a cylinder having a length of 25cm, a diameter of 5cm, 80 a hemispherical base, and a top having the shape of a truncated cone (cone angle  $\tan^{-1} 1/3$ ).

Using this tool, a container was blown with an average wall thickness of 0.3mm, ( $\pm 0.05$ mm). The tube was filled to 500 grams with an anaerobic 85 gasket paste, ANACURE 2098 (ANACURE is a Trade Mark), and subjected to accelerated ageing for ten days at 50°C. No polymerisation had taken place after ten days.

#### 90 Example 2

A second container was produced using the tool of Example 1, but with an average wall thickness of 0.6  $\pm 0.5$ mm. The container was filled with the same composition as in Example 1, and subjected to the 95 same accelerated ageing test. No polymerisation had taken place after ten days.

#### Example 3

A container as described in Example 1 was filled 100 with an anaerobically curing composition (ANACURE 2910 Gas Mains Penetrating Sealant), and sealed with a cap. A container was loaded in to a Sika bulk gun (9300-02), and the plunger was cranked down on to the container to a pressure of 400 kPa. 105 The container did not burst. The sealed nipple of the cap was cut open, and the sealant injected out under a pressure of 400 kPa. The container did not burst, and it was found that 510mls of the original 520mls of sealant loaded in to the container could be 110 expelled.

#### Example 4

The gun of Figure 2 was utilised with a collapsible container as described in Example 1. The anaerobic 115 sealant material was used to seal joints in an underground gas pipe.

It was found that shelf life of in excess of a year could be obtained, by using a collapsible polyethylene container, of the type described. When 120 the sealant was injected into flanges between the underground gas pipe, a complete seal was effected in from 10 to 15 minutes.

It will of course be appreciated that a wide range of variation of container designs is possible, in addition 125 to those specifically described above.

#### CLAIMS

1. A container for an anaerobically curing composition, adapted for use in a caulking gun or the

like, the said container having collapsible walls formed of a material having sufficient air permeability to prevent substantial curing of an anaerobic composition contained therein.

5 2. A container as claimed in Claim 1, having the form of an elongate cylinder, having an opening at a first end thereof, and a hemispherical end portion at the other end thereof.

10 3. A container as claimed in Claim 2, wherein the end of the container adjacent the opening is generally conical in shape.

15 4. A container as claimed in any one of the preceding claims, formed by a blow-moulding process.

20 5. A container as claimed in any one of the preceding claims, which contains an anaerobically-curable composition.

25 6. A caulking gun adapted for use with a container as claimed in any one of the preceding claims, the caulking gun comprising a cylinder, having a plunger slideably located therein, means for driving the plunger to an end of cylinder, to expel the sealant from the collapsible container, characterised in that the plunger in an interference fit 25 in the cylinder, and is adapted to form a knife-edge seal at its periphery.

30 7. A caulking gun as claimed in Claim 6, wherein the surface of the plunger adapted to contact the collapsible container has a hemispherical surface.

35 8. A caulking gun as claimed in Claim 6 or Claim 7, wherein the plunger is provided with a seal of a material which does not swell on contact with an anaerobically curable mastics composition.

9. A caulking gun as claimed in any one of Claims 35 to 8, including a conical support for a neck portion of the collapsible container.

10. A caulking gun as claimed in any one of Claims 6 to 9, in combination with a container as claimed in any one of Claims 1 to 5.

40 11. A method of sealing an underground pipe, which method comprises injecting a joint in the pipe with an anaerobically curing sealant composition, utilising a caulking gun and container combination as claimed in Claim 10.